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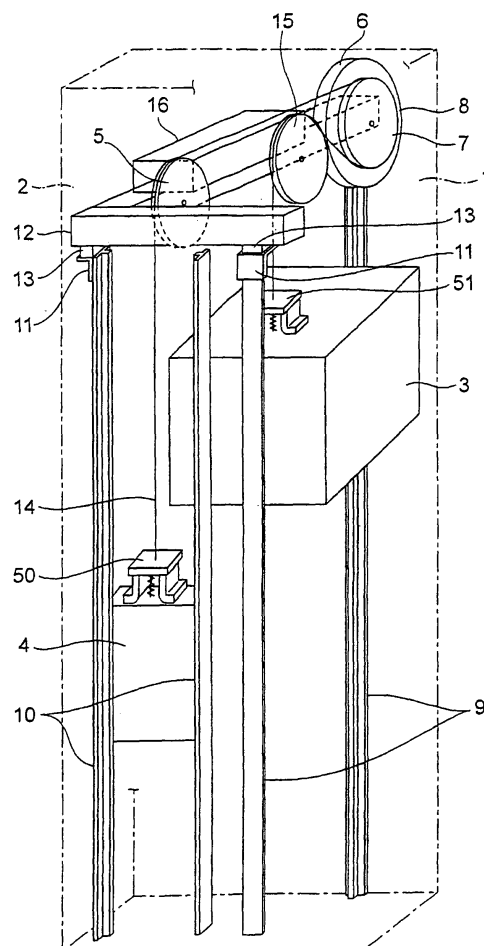
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(54) **Machine-room-less elevator**

(57) A sheave, a car side deflection wheel and a weight side deflection wheel are arranged on a straight line when viewed along a hoistway, and the sheave, the car side deflection wheel and the weight side deflection wheel have their axes arranged in parallel with respect to one another. In addition, a main rope, after ascending from a weight along the hoistway, is wrapped around an upper side of the weight side deflection wheel, and thereafter the main rope, after being wrapped around the sheave and the car side deflection wheel, descends in the hoistway to arrive at a car.

FIG. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a machine-room-less elevator with a winch and a deflection wheel arranged on the top of a hoistway.

BACKGROUND ART

[0002] Figs. 10 through 13 show a known machine-room-less elevator with 1:1 roping. In these figures, 1 designates a hoistway, 2 the top of the hoistway, 3 a car, 4 a weight, and 5 a deflection wheel that suspends the weight 4. 6 designates a winch that is installed on the hoistway top 2 and is composed of a sheave 7 and a motor 8. 9 designates a pair of car side guide rails that guide the vertical movement of the car 3. 10 designates a pair of weight side guide rails that guide the vertical movement of the weight 4. 11 designates support plates that are attached to tip ends of the car side guide rails 9 and the weight side rails 10, respectively. 12 designates a bed that is fixedly secured to the support plates 11 through resilient members 13 for holding the winch 6 and the deflection wheel 5. 14 designates a main rope that is wrapped around the sheave 7 of the winch 6 and the deflection wheel 5 and is fixedly attached at one end thereof to a rope stop 50 on an upper portion of the weight 4 and at the other end thereof to a rope stop 51 on an upper portion of the car 3.

[0003] The main rope 14 with its one end fixed to the rope stop 50 on the upper portion of the weight 4 ascends from the rope stop 50 along the hoistway 1, and is then wrapped around an upper side of the deflection wheel 5, after which it extends to the sheave 7 of the winch 6.

[0004] Thereafter, the main rope 14 is wrapped around the sheave 7. At this time, the main rope 14 extending from the deflection wheel 5 begins to be wrapped from a lower portion of the sheave 7. Then, the main rope 14, after having been wrapped around almost the entire circumference of the sheave 7 in the counterclockwise direction in Fig. 10, descends in the hoistway 1 to the car 3, and is finally fixedly attached to the rope stop 51 of the car 3.

[0005] With the machine-room-less elevator as constructed above, when the main rope 14 is wrapped around the sheave 7, that portion of the main rope 14 which extends from the deflection wheel 5 to the sheave 7 and that portion of the main rope 14 which extends from the sheave 7 to the car 3 cross each other, but they do not mutually interfere with each other.

[0006] That is, the winch 6 is installed in such a manner that the sheave 7 is offset from the deflection wheel 5 with a horizontal eccentricity of within 1.5 degrees and a vertical eccentricity of within 2.5 degrees. Fig. 12 and Fig. 13 are views that show the positional relation of the sheave 7 and the deflection wheel 5 in Fig. 10, wherein Fig. 12 is a plan view thereof, and Fig. 13 is a side ele-

vation thereof. Here, note that X axis, Y axis and Z axis represent an orthogonal coordinate system in Fig. 12 and Fig. 13, wherein the X axis indicates the direction of the rotation axis of the deflection wheel 5, the Y axis shows the horizontal direction, and the Z axis shows the vertical direction.

[0007] With the machine-room-less elevator of the above-mentioned construction, when the motor 8 of the winch 6 is driven to operate, the sheave 7 is caused to rotate whereby the main rope 14 is moved by the traction thereof. In accordance with the movement of the main rope 14, the car 3 and the weight 4 are operated to rise and fall in opposite directions, respectively.

[0008] The known machine-room-less elevator is constructed in the above-mentioned manner, with the winch 6 being arranged inclined against the deflection wheel 5 with respect to the horizontal and the vertical. As a result, there arises the following problem. That is, when a wire rope is used as the main rope 14, rubbing thereof at corner portions of a rope groove of each of the sheave 7 and the deflection wheel 5 can not be avoided. In addition, when a belt is used as the main rope 14, the belt would be subjected to an offset load, so an adverse influence might be given to the belt.

DISCLOSURE OF INVENTION

[0009] The present invention is intended to obviate the problems as referred to above, and has for its object to provide a machine-room-less elevator in which a main rope is wrapped around a plurality of wheels which are arranged in such a manner that grooves in the wheels for receiving the main rope are disposed on a straight line, thereby making it possible to ensure traction, prolong the usable life of the rope and reduce an installation space in a vertical direction of a hoistway.

[0010] In a machine-room-less elevator according to one aspect of the present invention, a sheave, a car side deflection wheel and a weight side deflection wheel are arranged on a straight line when viewed along a hoistway, and the sheave, the car side deflection wheel and the weight side deflection wheel have their respective axes arranged in parallel with respect to one another. A main rope, after ascending from a weight along the hoistway, is wrapped around an upper side of the weight side deflection wheel, and thereafter the main rope, after being wrapped around the sheave and the car side deflection wheel, descends in the hoistway to arrive at a car.

[0011] In addition, in a machine-room-less elevator according to another aspect of the present invention, a sheave, a weight side deflection wheel and an idle wheel are arranged on a straight line when viewed along a hoistway, and the sheave, the weight side deflection wheel and the idle wheel have their respective axes arranged in parallel with respect to one another. A main rope, after ascending from a weight along the hoistway, is wrapped around an upper side of the weight side deflection wheel, a lower side of the idle wheel and an upper side of the

sheave, and then descends in the hoistway to arrive at a car.

[0012] Moreover, in a machine-room-less elevator not part of the present invention, a sheave and a car side deflection wheel are arranged on a straight line when viewed along a hoistway, and an idle wheel is arranged under the sheave in an overlapped relation. The idle wheel, the sheave and the car side deflection wheel have their respective axes arranged in parallel with respect to one another. A main rope, after ascending from a weight along the hoistway, is wrapped around the idle wheel, the sheave and the car side deflection wheel, and thereafter descends in the hoistway to arrive at a car.

[0013] Furthermore, in a machine-room-less elevator according to a still further aspect of the present invention, a sheave, an idle wheel and a car side deflection wheel are arranged on a straight line when viewed along a hoistway, and the sheave, the idle wheel and the car side deflection wheel have their respective axes arranged in parallel with respect to one another. A main rope, after ascending from a weight along the hoistway, is wrapped around an upper side of the sheave, a lower side of the idle wheel and an upper side of the car side deflection wheel, and thereafter descends in the hoistway to arrive at a car.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

Fig. 1 is a perspective view of a machine-room-less elevator according to a first embodiment of the present invention.

Fig. 2 is a plan view of the top of a hoistway in Fig. 1.

Fig. 3 is a cross sectional arrow view taken along line A-A in Fig. 2.

Fig. 4 is a perspective view of a machine-room-less elevator according to a second embodiment of the present invention.

Fig. 5 is a plan view of the top of a hoistway in Fig. 4.

Fig. 6 is a perspective view of a machine-room-less elevator according to a third embodiment, which is not part of this invention.

Fig. 7 is a plan view of the top of a hoistway in Fig. 6.

Fig. 8 is a perspective view of a belt end fastening member.

Fig. 9 is a cross sectional arrow view taken along line B-B in Fig. 8.

Fig. 10 is a perspective view of a known machine-room-less elevator.

Fig. 11 is a plan view of the top of a hoistway in Fig. 10.

Fig. 12 is a plan view showing the positional relation between a sheave and a deflection wheel in Fig. 10.

Fig. 13 is a side elevation of Fig. 10.

BEST MODE FOR CARRYING OUT THE INVENTION

[0015] Hereinafter, preferred embodiments of the present invention will be described in detail while referring to the accompanying drawings. The same or equivalent members and parts are identified by the same symbols throughout the respective preferred embodiments. Embodiment 1.

[0016] Fig. 1 is a schematic perspective view of a machine-room-less elevator according to a first embodiment of the present invention. Fig. 2 is a plan view of the top of a hoistway in Fig. 1. Fig. 3 is a cross sectional arrow view taken along line A-A in Fig. 2.

[0017] In these figures, 1 designates a hoistway, 2 the top of the hoistway, 3 a car, 4 a weight, and 5 a deflection wheel from which the weight 4 is suspended. 6 designates a winch that is installed on the top 2 of the hoistway and is composed of a sheave 7 and a motor 8. 9 designates a pair of car side guide rails that guide the vertical movement of the car 3. 10 designates a pair of weight side guide rails that guide the vertical movement of the weight 4. 11 designates support plates that are attached to tip ends of the car side guide rails 9 and the weight side guide rails 10, respectively. 13 designates resilient members that are fixedly secured to the support plates 11, respectively, for preventing driving vibrations of the winch 6 from being transmitted to a building. 12 designates a bed fixedly secured to the support plates 11 through the resilient members 13. 14 designates a main rope that is fixedly attached at one end thereof to a rope stop 50 on an upper portion of the weight 4, and at the other end thereof to a rope stop 51 on an upper portion of the car 3. 15 designates a car side deflection wheel that is supported by the bed 12 with its axis being arranged in parallel to and between the sheave 7 and the weight side deflection wheel 5 in a row in such a manner that a groove in the sheave 7 around which the main rope 14 is wrapped, a groove in the car side deflection wheel 15 and a groove in the weight side deflection wheel 5 are arranged on a straight line.

[0018] 16 designates a control console that is fixedly mounted on the bed 12 for controlling the elevator. 17 designates a speed governor that is fixedly mounted on the bed 12 for detecting the speed of the elevator and stopping it upon emergency. 18 designates an inflating-deflating maintenance gangway with its one end rotatably mounted on the bed 12. The control console 16, the speed governor 17 and the gangway 18 are arranged at locations lower than the height of the winch 6. Here, note that the speed governor 17 and the gangway 18 are omitted in Fig. 1.

[0019] The main rope 14 with one end thereof fixedly attached to the rope stop 50 on the upper portion of the weight 4 ascends from the rope stop 50 along the hoistway 1 and is then wrapped around an upper side of the deflection wheel 5, after which the main rope 14 extends to the sheave 7 of the winch 6.

[0020] Thereafter, the main rope 14 is wrapped around

the sheave 7. At this time, the main rope 14 extending from the deflection wheel 5 begins to be wrapped from an upper portion of the sheave 7, and then goes almost halfway around the circumference of the sheave 7 in the counterclockwise direction in Fig. 1, after which the main rope 14 is continuously wrapped around an upper portion of the car side deflection wheel 15 over a half of the circumference thereof. Thereafter, the main rope 14 descends in the hoistway 1 to the car 3, where it is finally fixedly attached to the rope stop 51 of the car 3.

[0021] According to this machine-room-less elevator, since the deflection wheel 5, the car side deflection wheel 15 and the sheave 7 are arranged on a straight line, the main rope 14 is not forcibly fitted or engaged into the respective grooves in the wheels and the sheave. Accordingly, it becomes possible to ensure the prolongation of the life of the main rope 14 as well as elevator hoisting traction.

[0022] In addition, the bed 12 is fitted in the heightwise range of the winch 6, and the control console 16, the speed governor 17 and the maintenance gangway 18 are arranged at locations lower than the height of the winch 6. As a result, the space at the top 2 of the hoistway may be small.

[0023] Moreover, in the case of this machine-room-less elevator, the wrapping angle of the main rope 14 with respect to the sheave 7 can be from 120° , which is a minimum wrapping angle necessary to ensure a minimum traction, up to about 270° at the maximum. Thus, this is convenient when a great traction capability is required.

[0024] When a flat belt composed of a number of rows of thin built-in wire ropes is adopted as the main rope 14 in place of the wire rope, the sheave diameter can be reduced, whereby an unbalanced torque on the elevator can be accordingly decreased. Besides, the diameter of each of the winch 6, the sheave 7 and the deflection wheels 5, 15 can also be reduced, thus making it possible to diminish the space at the top of the hoistway.

[0025] Furthermore, although the respective axes of the car side deflection wheel 15, the sheave 7 and the weight side deflection wheel 5 are horizontal and parallel with respect to one another, they are not necessarily required to be horizontal.

Embodiment 2.

[0026] Fig. 4 is a perspective view of a machine-room-less elevator according to a second embodiment of the present invention. Fig. 5 is a plan view of the top of a hoistway of Fig. 4.

[0027] In this embodiment, when viewed along the hoistway 1, the sheave 7 of the winch 6, an idle wheel 19, and the weight side deflection wheel 5 are fixedly attached to the bed 12 on a straight line, and the respective axes of the sheave 7, the idle wheel 19 and the weight side deflection wheel 5 are horizontal and parallel with respect to one another.

[0028] The main rope 14 with one end thereof fixedly attached to the rope stop 50 on an upper portion of the weight 4 ascends from the rope stop 50 along the hoistway 1 and then is wrapped around an upper side of the deflection wheel 5. Thereafter, the main rope 14 is wrapped around a lower portion of the idle wheel 19 over a half of the circumference thereof, and it is then wrapped around an upper side of the sheave 7 over a half of the circumference thereof. Subsequently, the main rope 14 descends in the hoistway 1 to the car 3, where it is finally fixedly secured to the rope stop 51 of the car 3.

[0029] According to this embodiment, the wrapping angle of the main rope 14 with respect to the sheave 7 can be adjusted by the position of the idle wheel 19 fixedly mounted on the bed 12, so that a prescribed traction can be ensured.

[0030] In addition, since the sheave 7, the idle wheel 19 and the weight side deflection wheel 5 are arranged on a straight line in such a manner that their respective axes are arranged horizontal and parallel with respect to one another, it is possible to prolong the usable life of the main rope 14.

[0031] Moreover, since the height of the idle wheel 19 is lower than the height of the winch 6, the space at the top 2 of the hoistway may be small, as in the first embodiment.

[0032] Here, note that the respective axes of the sheave 7, the idle wheel 19 and the weight side deflection wheel 5 may not be horizontal.

Embodiment 3 (not part of this invention)

[0033] Fig. 6 is a perspective view of a machine-room-less elevator according to a third embodiment of the present invention. Fig. 7 is a plan view of the top of a hoistway in Fig. 6.

[0034] In this embodiment, the winch 6 is fixedly mounted on the bed 12 at a location above the weight 4 on the top 2 of the hoistway, and the idle wheel 19 is arranged under the winch 6 in an overlapped manner. In addition, the sheave 7 and the car side deflection wheel 15 are fixed to the bed 12 on a straight line when viewed along the hoistway 1, and their respective axes are parallel with each other.

[0035] The main rope 14 with one end thereof being fixedly attached to the rope stop 50 at an upper portion of the weight 4 ascends from the rope stop 50 along the hoistway 1, and it is then wrapped at its one side around the idle wheel 19. Thereafter, the main rope 14, after having been wrapped around a one side of the sheave 7 over about a half of the circumference thereof, is wrapped around the car side deflection wheel 15 over about a quarter of the circumference thereof. Subsequently, the main rope 14 descends in the hoistway 1 to the car 3, where it is finally fixedly attached to the rope stop 51 of the car 3.

[0036] According to this embodiment, the wrapping angle of the main rope 14 with respect to the sheave 7 can

be adjusted by the position of the idle wheel 19 fixedly mounted on the bed 12, so that a prescribed traction can be ensured.

[0037] In addition, since the idle wheel 19, the sheave 7 and the car side deflection wheel 15 are arranged on a straight line and their respective axes are parallel with respect to one another, it is possible to prolong the usable life of the main rope 14.

[0038] Moreover, though not illustrated, the idle wheel 19 may be arranged between the sheave 7 and the car side deflection wheels 15, so that the main rope 14, after ascending from the weight 4 along the hoistway 1, is wrapped around an upper side of the sheave 7, after which the main rope 14 is wrapped around a lower side of the idle wheel 19, and it is then continuously wrapped around an upper side of the car side deflection wheel 15 over about a half of the circumference thereof, and finally descends in the hoistway 1 to arrive at the car 3. At this time, the sheave 7, the idle wheel 19 and the car side deflection wheel 15 are arranged on a straight line when viewed along the hoistway 1, and the respective axes of the sheave 7, the idle wheel 19 and the weight side deflection wheel 5 are parallel with respect to one another. As a result, the life of the main rope 14 can be prolonged. Embodiment 4.

[0039] Fig. 8 is a perspective view of a fixing member fixedly attached to an end portion of a belt when the belt is used as the main rope 14 of the first through third embodiments. Fig. 9 is a cross sectional arrow view taken along line B-B of Fig. 8.

[0040] In these figures, 20 designates a fixture having a plurality of protruded portions 20a that protrude in a horizontal direction, and 21 designates a presser plate having concave portions 21a formed so as to conform to the protruded portions 20a of the fixture 20. The main rope 14 is clamped between the fixture 20 and the presser plate 21 by means of bolts 22. The presser plate 21 has a metal fitting 23 that serves to fix a turned end portion of the main rope 14, and this metal fitting 23 is fastened to the presser plate 21 by means of a bolt 24. 25 designates a hanger bolt that is combined with the fixture 20 by means of a pin 26.

[0041] According to this embodiment, similar to a shackle for a wire rope generally adopted, a sufficient holding force can be expected against the main rope 14 in the form of the belt, and hence the apparatus can be constructed in compact size, and the construction thereof at an installation site is also easy.

[0042] Although not explained in detail in the above-mentioned respective embodiments, a machine-room-less elevator may be constructed by combining the first through third embodiments with one another in accordance with a change in size of the car or the weight.

[0043] In addition, although in the respective embodiments, the bed 12 is fixedly mounted on the car side guide rails 9 and the weight side guide rails 10, it may instead be fixed to a wall surface which is a wall portion of the hoistway or a pillar which is a wall portion extending

along the wall surface.

1. A machine-room-less elevator comprising:

a hoistway (1);
a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);
a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);
a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);
a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;
a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1);
a car side deflection wheel (15) around which said main rope (14) is wrapped between said car (3) and said sheave (7); and
a weight side deflection wheel (5) around which said main rope (14) is wrapped between said weight (4) and said sheave (7);

wherein said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) have their respective axes arranged in parallel with respect to one another; and
wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said weight side deflection wheel (5), and thereafter said main rope (14), after being wrapped around said sheave (7) and said car side deflection wheel (15), descends in said hoistway (1) to arrive at said car (3).

2. The machine-room-less elevator as set forth in 1, wherein the respective axes of said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) are parallel with respect to one another.

3. A machine-room-less elevator comprising:

a hoistway (1);
a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);
a car (3) that is guided along said car side guide

rails (9) for vertical movement inside said hoistway (1);

a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);

a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;

a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1); and

a weight side deflection wheel (5) and an idle wheel (19) around which said main rope (14) is wrapped between said weight (4) and said sheave (7);

wherein said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) have their respective axes arranged in parallel with respect to one another; and

wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said weight side deflection wheel (5), a lower side of said idle wheel (19) and an upper side of said sheave (7), and then descends in said hoistway (1) to arrive at said car (3).

4. The machine-room-less elevator as set forth in 3, wherein the respective axes of said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) are parallel with respect to one another.

5. A machine-room-less elevator comprising:

a hoistway (1);

a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);

a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);

a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);

a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;

a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1); an idle wheel (19) around which said main rope (14) is wrapped between said weight (4) and said sheave (7); and

a car side deflection wheel (15) around which said main rope (14) is wrapped between said car (3) and said sheave (7);

wherein said sheave (7) and said car side deflection wheel (15) are arranged on a straight line when viewed along said hoistway (1), and said idle wheel (19) is arranged under said sheave (7) in an overlapped relation, and said idle wheel (19), said sheave (7) and said car side deflection wheel (15) have their respective axes arranged in parallel with respect to one another; and

wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around said idle wheel (19), said sheave (7) and said car side deflection wheel (15), and thereafter descends in said hoistway (1) to arrive at said car (3).
6. The machine-room-less elevator as set forth in 5, wherein the respective axes of said sheave (7) and said car side deflection wheel (15) are parallel with respect to each other.

7. A machine-room-less elevator comprising:

a hoistway (1);

a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);

a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);

a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);

a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;

a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1); and

an idle wheel (19) and a car side deflection wheel (15) around which said main rope (14) is wrapped between said sheave (7) and said car (3);

wherein said sheave (7), said idle wheel (19) and

said car side deflection wheel (15) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said idle wheel (19) and said car side deflection wheel (15) have their respective axes arranged in parallel with respect to one another; and

wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said sheave (7), a lower side of said idle wheel (19) and an upper side of said car side deflection wheel (15), and thereafter descends in said hoistway (1) to arrive at said car (3).

8. The machine-room-less elevator as set forth in 7, wherein the respective axes of said sheave (7), said idle wheel (19) and said car side deflection wheel (15) are horizontal.

9. The machine-room-less elevator as set forth in any one of 1 through 8, wherein a wrapping angle of said main rope (14) with respect to said sheave (7) is in the range of 120 - 270° .

10. The machine-room-less elevator as set forth in any one of 1 through 9, wherein said main rope (14) comprises a wire rope or a belt.

11. The machine-room-less elevator as set forth in 5, wherein said idle wheel (19) is arranged inside the top (2) of said hoistway (1) at a location under a bed (12) that supports said winch (6).

12. The machine-room-less elevator as set forth in any one of 1 through 11, wherein said bed (12), which is provided inside the top (2) of said hoistway (1) to support said winch (6), is arranged so as to fit in a heightwise range of said winch (6).

13. The machine-room-less elevator as set forth in 11 or 12,

wherein a control console (16) that controls the operation of said elevator, a speed governor (17) that stops said elevator upon emergency by detecting the vertical moving speed of said elevator, and a maintenance gangway (18) are respectively mounted on said bed (12), and the height of each of said control console (16), said speed governor (17) and the maintenance gangway (18) is lower than the height of said winch (6).

14. The machine-room-less elevator as set forth in any one of 11 through 13, wherein said bed (12) is fixedly secured to either one of said car side guide rails (9), said weight side guide rails (10) and a wall portion of said hoistway (1).

15. The machine-room-less elevator as set forth in 14, wherein said bed (12) is fixedly secured through a resilient member (13) to either one of said car side guide rails (9), said weight side guide rails (10) and a wall portion of said hoistway (1).

16. The machine-room-less elevator as set forth in any one 10 and 12 through 15, wherein one end of said belt is clamped by a fixture having protruded portions and a presser plate having concave portions formed so as to conform to said protruded portions.

Claims

1. A machine-room-less elevator comprising:

a hoistway (1);
a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);
a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);
a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);
a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;
a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1);
a car side deflection wheel (15) around which said main rope (14) is wrapped between said car (3) and said sheave (7); and
a weight side deflection wheel (5) around which said main rope (14) is wrapped between said weight (4) and said sheave (7);

wherein said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) have their respective axes arranged in parallel with respect to one another; and
wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said weight side deflection wheel (5), and thereafter said main rope (14), after being wrapped around said sheave (7) and said car side deflection wheel (15), descends in said hoistway (1) to arrive at said car (3).

2. The machine-room-less elevator as set forth in claim 1, wherein the respective axes of said sheave (7), said car side deflection wheel (15) and said weight side deflection wheel (5) are parallel with respect to one another.

3. A machine-room-less elevator comprising:

a hoistway (1);
a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said

- hoistway (1);
 a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);
 a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);
 a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;
 a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1); and
 a weight side deflection wheel (5) and an idle wheel (19) around which said main rope (14) is wrapped between said weight (4) and said sheave (7);
- wherein said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) have their respective axes arranged in parallel with respect to one another; and
 wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said weight side deflection wheel (5), a lower side of said idle wheel (19) and an upper side of said sheave (7), and then descends in said hoistway (1) to arrive at said car (3).
4. The machine-room-less elevator as set forth in claim 3, wherein the respective axes of said sheave (7), said weight side deflection wheel (5) and said idle wheel (19) are parallel with respect to one another.
5. A machine-room-less elevator comprising:
 a hoistway (1);
 a pair of car side guide rails (9) and a pair of weight side guide rails (10) installed inside said hoistway (1);
 a car (3) that is guided along said car side guide rails (9) for vertical movement inside said hoistway (1);
 a weight (4) that is guided along said weight side guide rails (10) for vertical movement inside said hoistway (1);
 a winch (6) that is arranged in said hoistway (1) at a top (2) of said hoistway (1) above a top floor stop position of said car (3), said winch (6) having a motor portion (8) and a sheave (7) that is driven to be rotated by said motor portion (8) for moving said car (3) and said weight (4) in a vertical direction;
 a main rope (14) being fixedly attached at one end thereof to said car (3) and at the other end thereof to said weight (4) for hanging said car (3) and said weight (4) inside said hoistway (1); and
 an idle wheel (19) and a car side deflection wheel (15) around which said main rope (14) is wrapped between said sheave (7) and said car (3);
- wherein said sheave (7), said idle wheel (19) and said car side deflection wheel (15) are arranged on a straight line when viewed along said hoistway (1), and said sheave (7), said idle wheel (19) and said car side deflection wheel (15) have their respective axes arranged in parallel with respect to one another; and
 wherein said main rope (14), after ascending from said weight (4) along said hoistway (1), is wrapped around an upper side of said sheave (7), a lower side of said idle wheel (19) and an upper side of said car side deflection wheel (15), and thereafter descends in said hoistway (1) to arrive at said car (3).
6. The machine-room-less elevator as set forth in claim 5, wherein the respective axes of said sheave (7), said idle wheel (19) and said car side deflection wheel (15) are horizontal.
7. The machine-room-less elevator as set forth in any one of claim 1 through claim 6, wherein a wrapping angle of said main rope (14) with respect to said sheave (7) is in the range of 120 - 270°.
8. The machine-room-less elevator as set forth in any one of claim 1 through claim 7, wherein said main rope (14) comprises a wire rope or a belt.
9. The machine-room-less elevator as set forth in any one of claim 1 through claim 8, wherein said bed (12), which is provided inside the top (2) of said hoistway (1) to support said winch (6), is arranged so as to fit in a heightwise range of said winch (6).
10. The machine-room-less elevator as set forth in claim 9, wherein a control console (16) that controls the operation of said elevator, a speed governor (17) that stops said elevator upon emergency by detecting the vertical moving speed of said elevator, and a maintenance gangway (18) are respectively mounted on said bed (12), and the height of each of said control console (16), said speed governor (17) and the maintenance gangway (18) is lower than the height of said winch (6).

11. The machine-room-less elevator as set forth in claim 9 or claim 10, wherein said bed (12) is fixedly secured to either one of said car side guide rails (9), said weight side guide rails (10) and a wall portion of said hoistway (1). 5
12. The machine-room-less elevator as set forth in claim 11, wherein said bed (12) is fixedly secured through a resilient member (13) to either one of said car side guide rails (9), said weight side guide rails (10) and a wall portion of said hoistway (1). 10
13. The machine-room-less elevator as set forth in any one of claims 8-12, wherein one end of said belt is clamped by a fixture having protruded portions and a presser plate having concave portions formed so as to conform to said protruded portions. 15

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FIG. 1

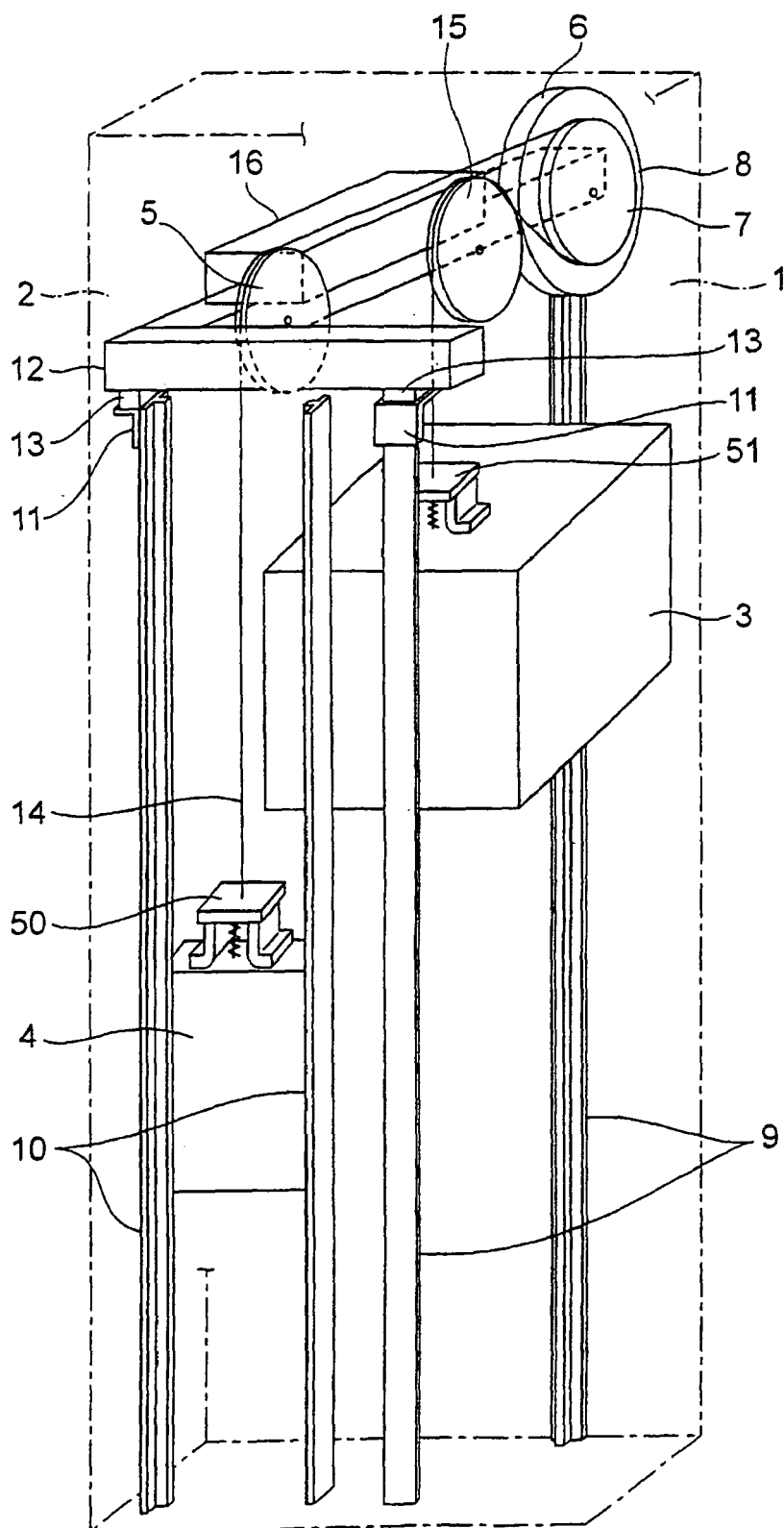


FIG. 2

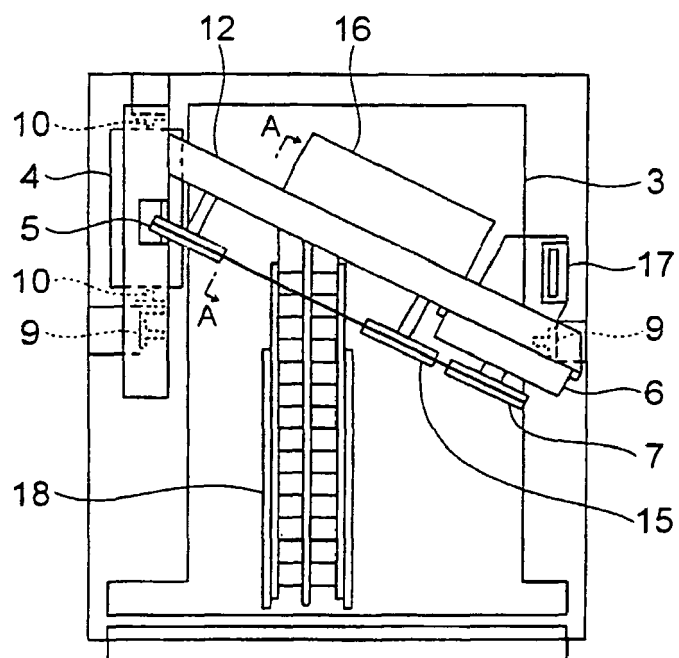


FIG. 3

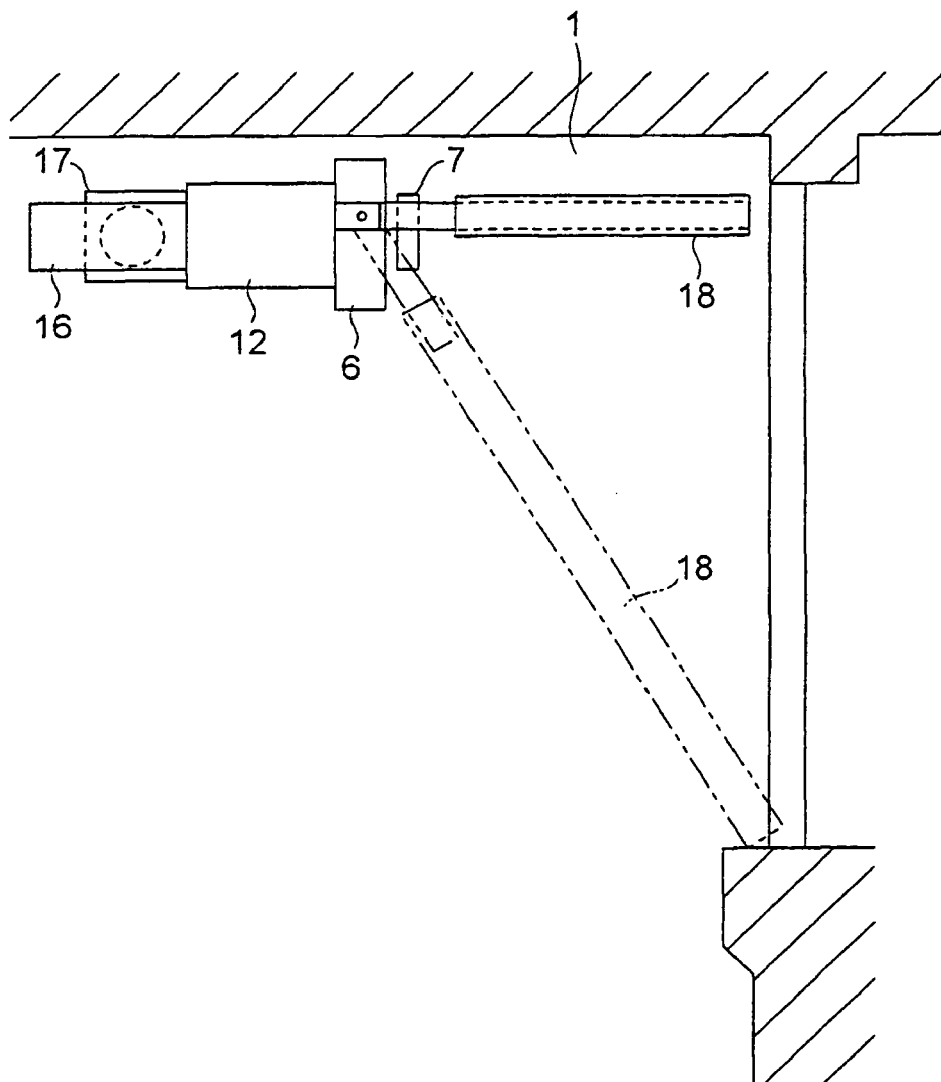


FIG. 4

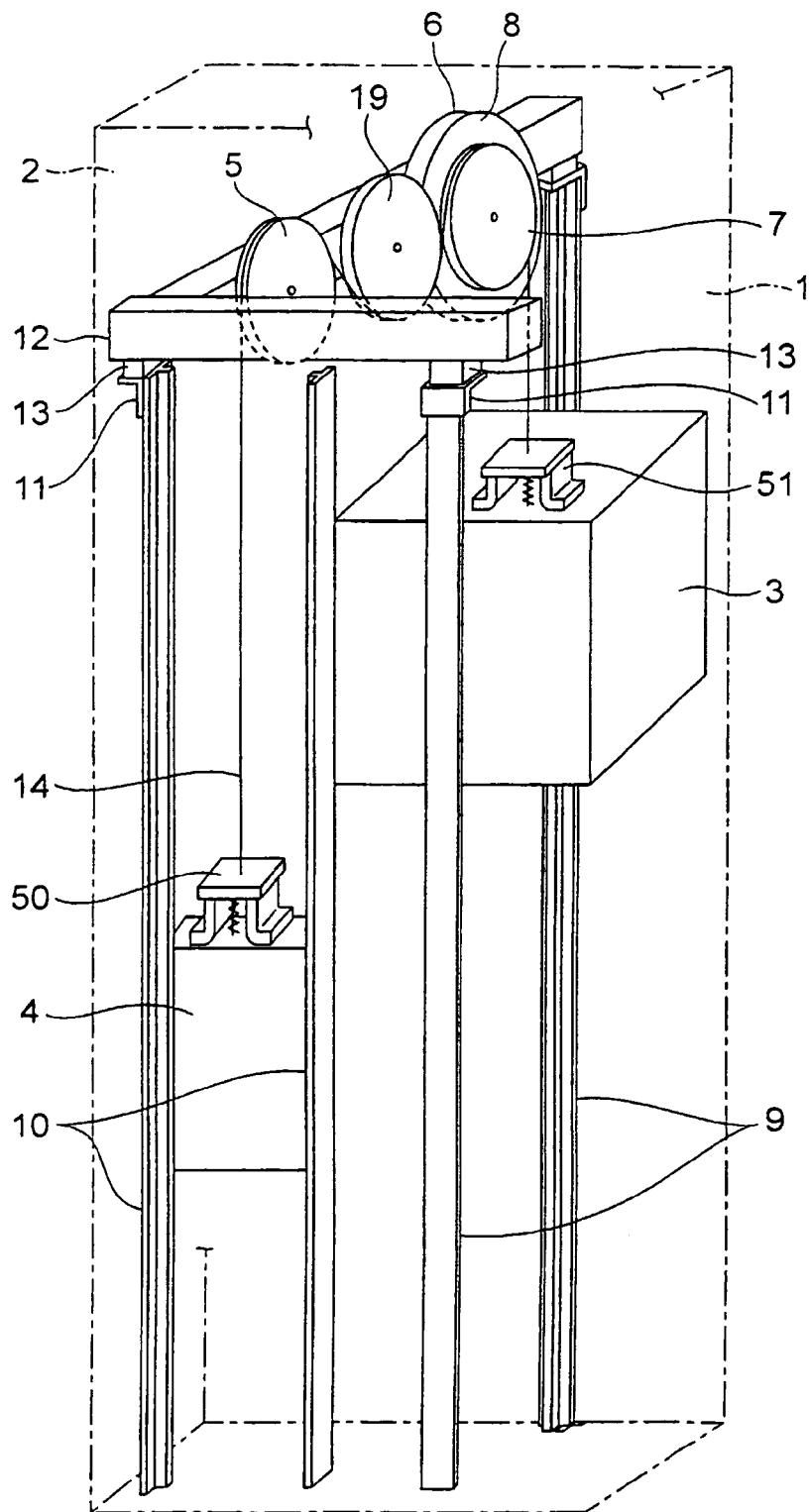


FIG. 5

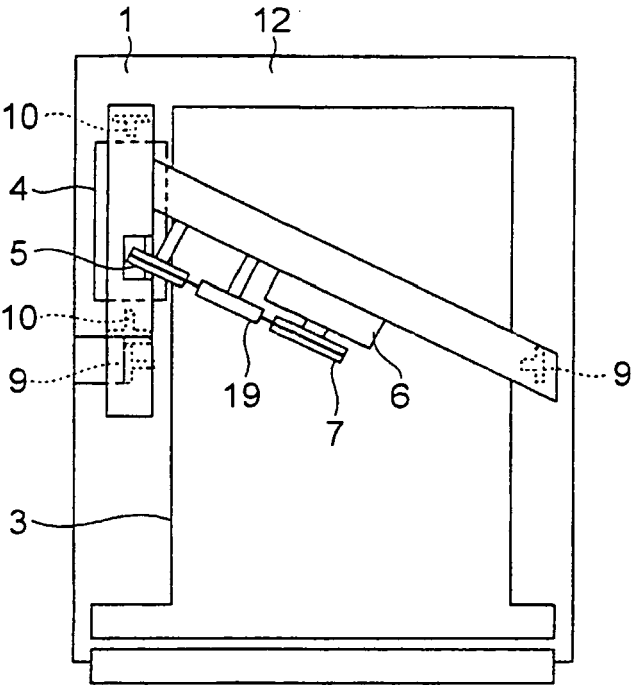


FIG. 6

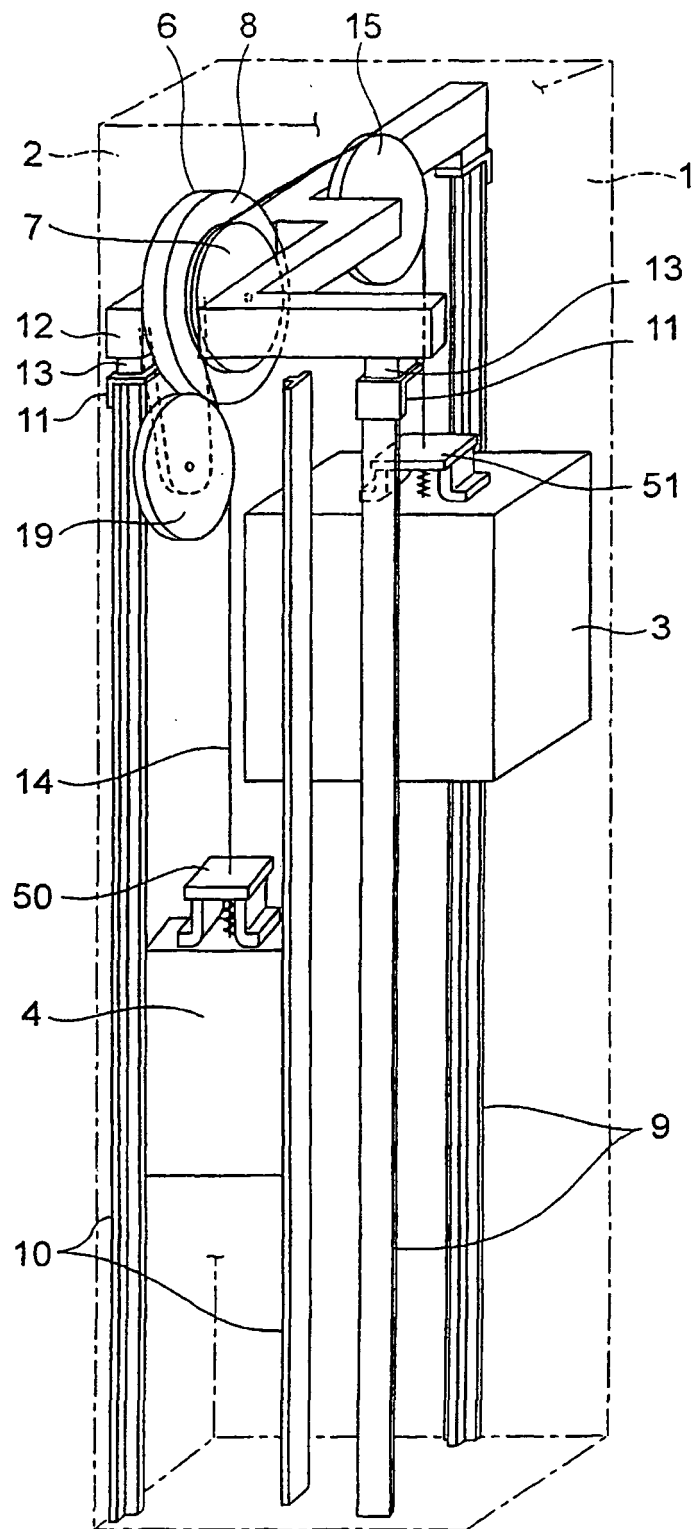


FIG. 7

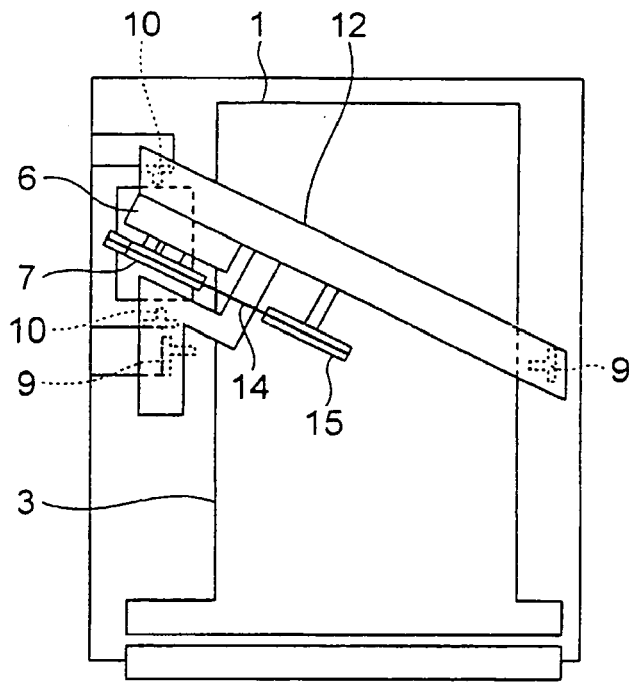


FIG. 8

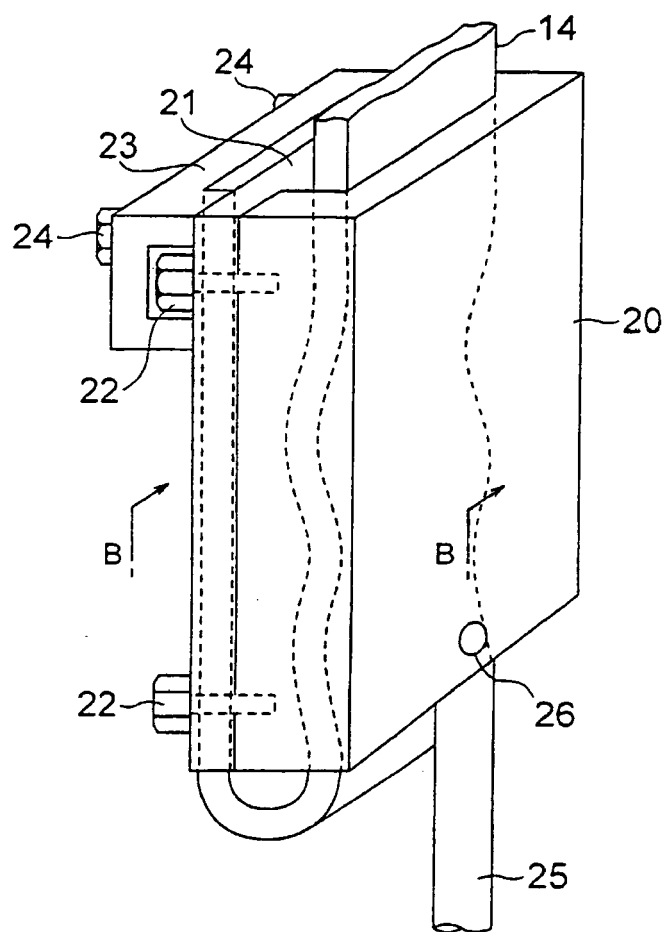


FIG. 9

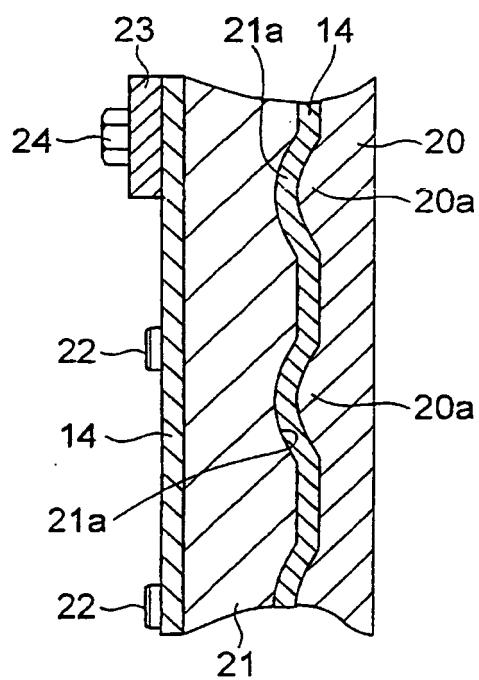


FIG. 10

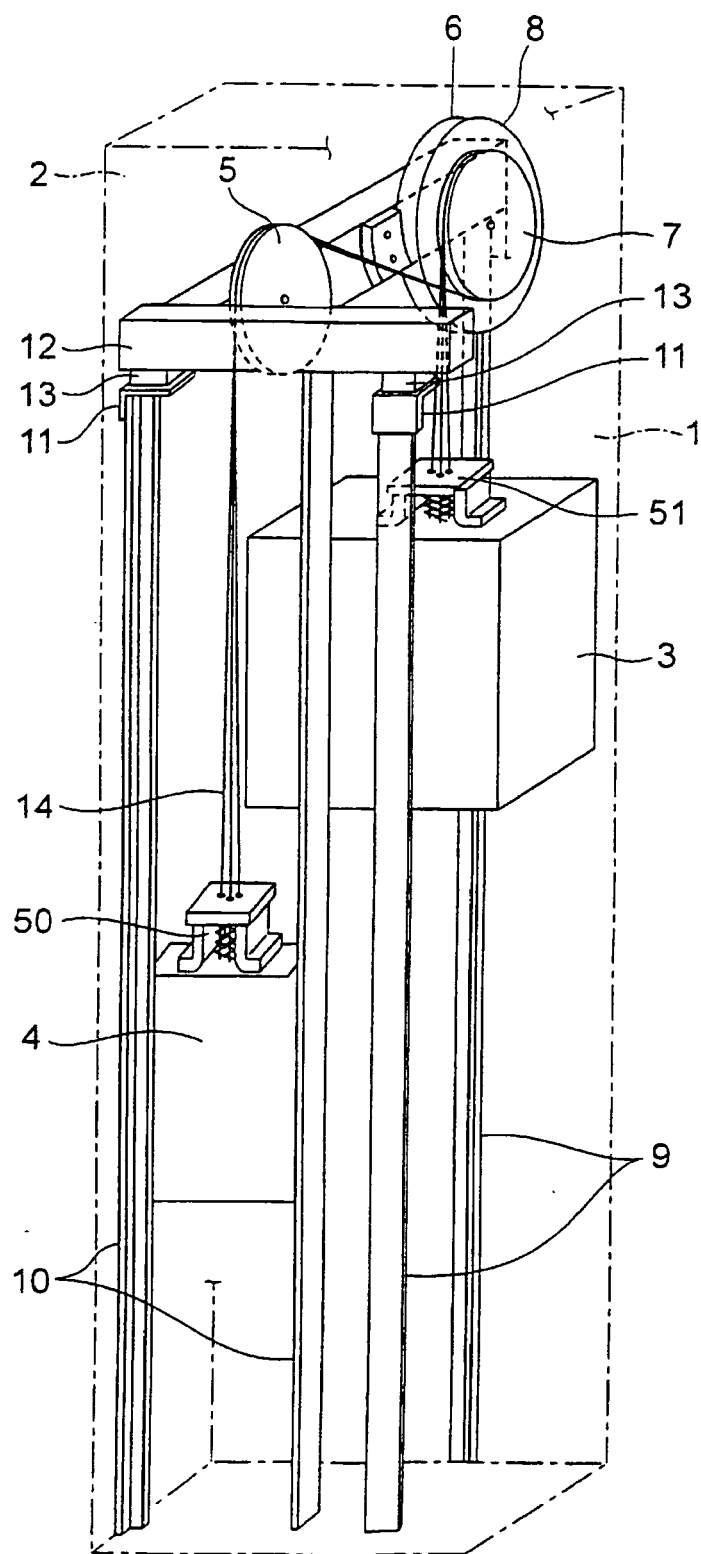


FIG.11

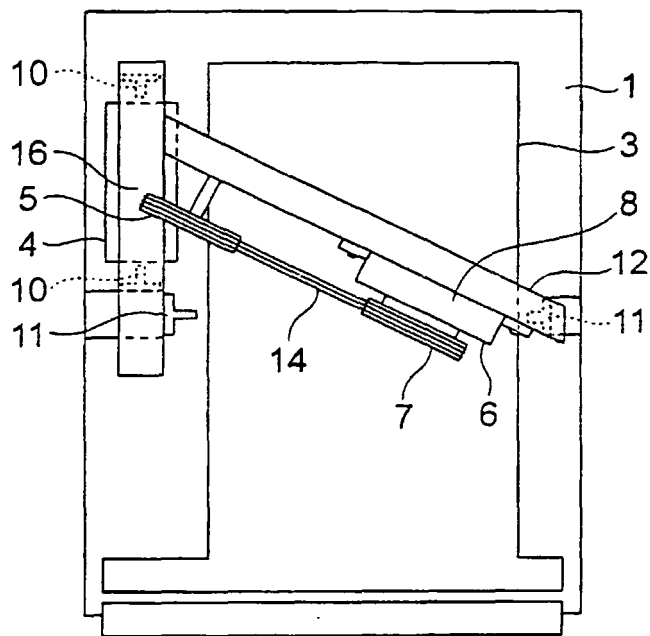


FIG. 12

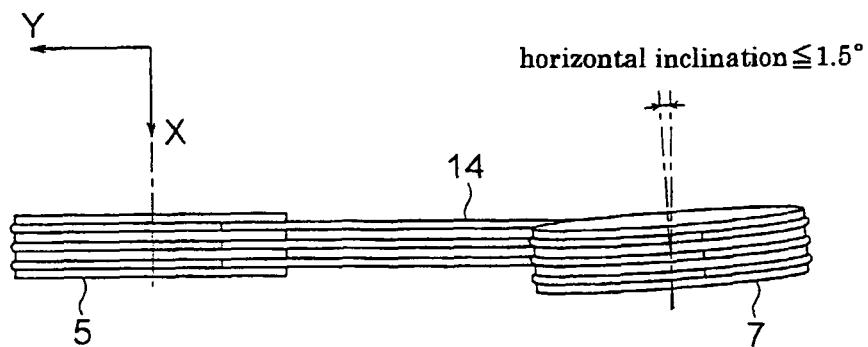
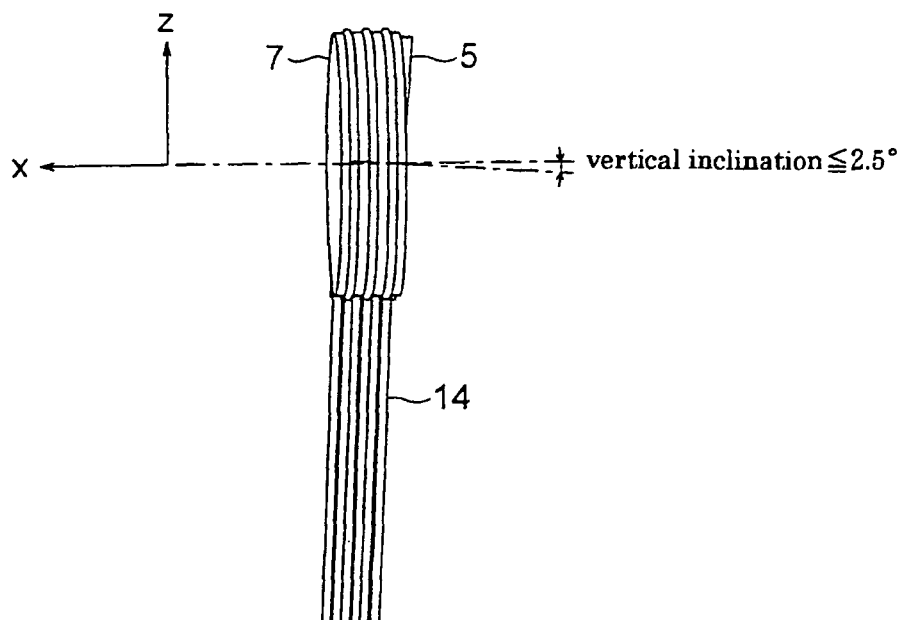


FIG. 13





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 7870

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	W0 99/43596 A (OTIS ELEVATOR CO [US]) 2 September 1999 (1999-09-02)	1,2,7,8	INV. B66B7/00 B66B11/08
Y	* abstract; figure 8 *	9,13	
X	EP 0 953 538 A (TOKYO SHIBAURA ELECTRIC CO [JP]) 3 November 1999 (1999-11-03) * paragraphs [0082] - [0089]; figure 13 *	3,4	
X	JP 08 175623 A (DAIFUKU KK) 9 July 1996 (1996-07-09) * abstract; figures 1,4,11 *	5	
Y	EP 1 125 883 A (CEAM S R L [IT]) 22 August 2001 (2001-08-22)	9	
A	* figures 1,2 *	10-12	
Y	W0 01/53186 A (OTIS ELEVATOR CO [US]) 26 July 2001 (2001-07-26) * abstract; figure 6 *	13	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B66B
Place of search		Date of completion of the search	Examiner
The Hague		31 August 2009	Janssens, Gerd
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 00 7870

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-08-2009

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 9943596	A	02-09-1999	DE	69926988 D1	06-10-2005
			DE	69926988 T2	23-02-2006
			EP	1042209 A2	11-10-2000
			ES	2244176 T3	01-12-2005
			PT	1042209 E	30-11-2005

EP 0953538	A	03-11-1999	CN	1233583 A	03-11-1999
			DE	69918218 D1	29-07-2004
			DE	69918218 T2	30-06-2005
			US	6247557 B1	19-06-2001

JP 8175623	A	09-07-1996	NONE		

EP 1125883	A	22-08-2001	IT	RM20000010 U1	19-07-2001

WO 0153186	A	26-07-2001	CN	1395540 A	05-02-2003
			DE	60102567 D1	06-05-2004
			DE	60102567 T2	05-08-2004
			EP	1255688 A1	13-11-2002
			ES	2218371 T3	16-11-2004
			JP	2003520171 T	02-07-2003
			PT	1255688 E	30-07-2004
			TW	250931 Y	21-11-2004
			US	6353979 B1	12-03-2002
